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(54) **Shift apparatus**

Schalteneinrichtung

Dispositif de changement de vitesses

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**Description****BACKGROUND OF THE INVENTION**

The present invention relates to a shift apparatus according to the precharacterizing portion of claim 1.

From DE-A1-39 23 508 there is known such a shift apparatus having a shift lever which is moveable in a first (longitudinal) and a second (transverse) direction.

Said shift lever is supported by a cardan joint which allows pivoting of said lever around a transverse and a longitudinal axis. At a bottom end of said shift lever, there is provided a spring-biased check pin which is moveable along a guide path formed in an engagement housing 39 (Rastengehäuse 39) below said cardan joint and capable to engage with a number of recesses formed along said guide path. Said check pin is, with respect to the cardan joint, provided on the opposite side of said shift lever and moveable in a direction parallel to the longitudinal axis of the shift lever.

United States Patent No. 4,365,522 issued on Dec. 28, 1982 to Kubota, United States Patent No. 5,079,966 issued on Jan. 14, 1992 to Ishizuki, and United States Patent No. 5,156,061 issued on Oct. 20, 1992 to Ishizuki, disclose shift apparatus for automatic transmission vehicles, each of which includes a gear shift lever rotatably supported about an axis on a vehicle body. A check member is coupled with the gear shift lever and cooperates with a position plate.

United States Patent No. 5,044,221 issued on September 3, 1991 discloses a shift apparatus for automatic transmission vehicles, which includes a gear shift lever slidable along a cranked guide slot formed on a console box secured to a vehicle body. A pivotal latch member is confined by a check mechanism so as to hold the gear shift lever without play in the guide slot.

It is an objective underlying the present invention to create a shift apparatus which can be produced at low production costs, which is durable in operation and which requires less space than the conventional constructions.

According to the present invention, this object has been performed by a shift apparatus as defined in claim 1.

**BRIEF DESCRIPTION OF THE DRAWINGS**

Fig. 1 is a top plan view of a console box of a shift apparatus according to the present invention, showing a cranked guide slot;

Fig. 2 is a sectional view, partially broken away, of the shift apparatus, taken along the line II-II of Fig. 1, showing a gear shift lever in a neutral position;

Fig. 3 is a sectional view of the shift apparatus, taken along the line III-III of Fig. 2, showing the gear shift lever in a parking position; and

Fig. 4 is a sectional view of the shift apparatus, taken along the line IV-IV of Fig. 2, showing a check

ball engaged with a recess 50R on a position plate.

**DESCRIPTION OF THE PREFERRED EMBODIMENT**

Referring now to Fig. 1, there is shown a top wall of a console box 100 secured to a vehicle body. The top wall is formed with a cranked guide slot 110 through which a gear shift lever 26 projects upwardly so as to be movable therealong. As shown in Fig. 1, the cranked guide slot 110 includes a longitudinal longer part 112, a longitudinal shorter part 116 connected through a lateral part 114, and a lateral part 118 extending from an end of the longitudinal shorter part 116. Arranged along the cranked guide slot 110 are operational shift positions of the gear shift lever 26, which include a parking position "P", a reverse position "R", a neutral position "N", a drive position "D", a first speed position "F", and a second speed position "S" as indicated in phantom circle lines in Fig. 1. The operational shift positions "P" to "S" correspond to gear positions of an automatic transmission (not shown) to which the gear shift lever 26 is connected. The shift positions "P", "R" and "N" are disposed in the longitudinal longer part 112. The shift position "D" is disposed at the joint corner of the lateral part 114 and the longitudinal shorter part 116 and the shift position "S" is at the joint corner of the longitudinal shorter part 116 and the lateral part 118. The shift position "F" is disposed at the end of the lateral part 118.

As shown in Fig. 2, a shaft 14 is disposed between two opposed brackets 12, 12 secured to a base plate 10 of the vehicle body. The shaft 14 has a first axis X extending in a lateral or transverse direction with respect to the vehicle body. The shaft 14 has small-diameter portions 16, 16 projecting outwardly from opposite sides thereof and inserted into through-holes 18, 18 which are formed on the brackets 12, 12. Thus, the shaft 14 is rotatably supported on the brackets 12, 12.

As shown in Fig. 3, a bearing bracket 22 is secured to the shaft 14 so as to rotatably support a pivot pin 20. The pivot pin 20 has a second axis Y, as seen in Fig. 4, extending laterally with respect to the first axis X of the shaft 14. The pivot pin 20 is rotatable about the second axis Y. As seen in Figs. 2 and 3, a channel-shaped bracket 24 is secured to the pivot pin 20 such that opposite ends of the pivot pin 20 project outwardly through opposite end walls of the bracket 24. The bracket 24 is disposed so as to straddle the bearing bracket 22 on the shaft 14 as seen in Fig. 3. Thus, the bracket 24 is supported on the shaft 14 so as to tilt or rotate about the second axis Y of the pivot pin 20.

A gear shift lever 26 is secured at its lower end 28 to the bracket 24 for unitary motion therewith. The gear shift lever 26 is tiltable about the second axis Y of the pivot pin 20 and rotatable about the first axis X of the shaft 14. Thus, the gear shift lever 26 is pivotable about the first and second axes X and Y to thereby movable in the longitudinal and lateral directions with respect to the vehicle body.

As seen in Fig. 1, a sleeve 30 is secured at its inner end 32 to the gear shift lever 26 and a slant side edge of the bracket 24. The sleeve 30 makes a unitary motion with the gear shift lever 26. The sleeve 30 has an outer end 34 at which a check ball 36 is supported by a ball seat 38 fitted into the sleeve 30. The ball seat 38 includes a body portion 40 contacting the check ball 36 and having a slightly smaller diameter than an inner diameter of the sleeve 30, and a neck portion 42 projecting inwardly from the body portion 40. Thus, the ball seat 38 is formed with an inside shoulder against which one end of a coil spring 44 bears. The other end of the coil spring 44 is disposed at the inner end 32 of the sleeve 30 such that the coil spring 44 is held compressed in the sleeve 30. The ball seat 38 is always urged outwardly by the coil spring 44 to push the check ball 36 outwardly in the sleeve 30.

As shown in Fig. 2, the check ball 36 is urged against a cam surface 48 of a position plate 46 stationarily mounted on the base plate 10. As seen in Fig. 3, the cam surface 48 is formed with a plurality of hemispherical recesses 50P, 50R, 50N, 50D, 50F and 50S positioned on loci which are drawn by the outer end 34 of the sleeve 30. The recesses 50P, 50R, 50N and 50F are formed on an outer arcuate line 60 while the recesses 50D and 50S are on an inner arcuate line 62.

As best shown in Fig. 3, the recesses 50P to 50S are mutually communicated with each other through guide grooves 52 intervened between the adjacent two thereof, for instance, the recesses 50R and 50N are communicated through the guide groove 52. The recesses 50P to 50S and the guide grooves 52 have respective depths determined by an angle which is made between the sleeve 30 and the cam surface 48 of the position plate 46.

The recesses 50P to 50S are engageable with the check ball 36 according to the shifting motion of the gear shift lever 26 along the cranked guide slot 110 of the console box 100. The cam surface 48 with the recesses 50P to 50S cooperates with the check ball 36 in such a manner as described below, for retaining the gear shift lever 26 in the respective operational shift positions "P" through "S" as seen in Fig. 1.

With the gear shift lever 26 positioned at the parking position "P", the check ball 36 on the sleeve 30 is engaged with the recess 50P as shown in Fig. 3. When the gear shift lever 26 is guided from the position "P" to the positions "R" and "N" along the longitudinal longer part 112 of the cranked guide slot 110 by rotating about the first axis X of the shaft 14, the check ball 36 is disengaged from the recess 50P and allowed to move toward the recess 50N on the outer arcuate line 60 as seen in Fig. 3. During this movement, the gear shift lever 26 is kept in an upright state as seen in Fig. 2. When the gear shift lever 26 is in the position "N" as seen in Fig. 1, the check ball 36 is engaged with the recess 50N as shown in Fig. 2. Then, when the gear shift lever 26 is guided from the position "N" to the position "D" along the lateral

part 114 of the cranked guide slot 110 by tilting about the second axis Y of the pivot pin 20, the check ball 36 is allowed to move from the recess 50N to the recess 50D through the guide groove 52 therebetween. Subsequently, when the gear shift lever 26 is guided from the position "D" to the position "S" along the longitudinal shorter part 116 of the cranked guide slot 110 by rotating about the first axis X of the shaft 14 while being kept at tilt about the second axis Y of the pivot pin 20, the check ball 36 is allowed to move from the recess 50D to the recess 50S on the inner arcuate line 62 as seen in Fig. 3.

Finally, when the gear shift lever 26 is guided from the position "S" to the position "F" along the lateral part 118 of the cranked guide slot 110 by tilting back about the second axis Y of the pivot pin 20 so as to return to the upright state, the check ball 36 is allowed to move from the recess 50S to the recess 50F.

During the entire movement of the gear shift lever 26 along the cranked guide slot 110, the check ball 36 on the sleeve 30 is always kept in contact with the cam surface 48 of the position plate 46. When the gear shift lever 26 is guided along the cranked guide slot 110 in reverse sequence, namely from the position "F" to the position "P", the check ball 36 cooperates with the cam surface 48 with the recesses 50P to 50F in same manner as mentioned above.

Further, the position plate may be replaced by one having another pattern of arrangement of the recesses, depending upon operational shift positions of the gear shift lever.

## Claims

1. A shift apparatus comprising a shaft (14) having a predetermined first axis (X) which is rotatable about said predetermined first axis (X), a bracket (24), a gear shift lever (26) secured to said bracket (24) for unitary motion therewith, means (20) for supporting said bracket (24) on said shaft (14) to allow tilting of said gear shift lever (26) about a second axis (Y) extending transverse with respect to said first axis (X), a check mechanism including a spring-biased member urged against a cam surface (48) of a stationary plate (46) such that said spring-biased member engages a plurality of recesses (50P, 50R, 50N, 50F, 50D, 50S) arranged on arcuate lines (60, 62), **characterized in that** said check mechanism includes a sleeve (30) which houses a spring (44) and supports a check ball (36) at its outer end (34), said sleeve (30) being slantingly secured at its inner end (32) to the gear shift lever (26) such that said check ball (36) engages said plurality of recesses during unitary motion of said sleeve (30) with said shift lever (26).
2. A shift apparatus as set forth in claim 1, **characterized in that** said supporting means includes a pivot

pin (20) rotatable about said predetermined second axis (Y) and mounting said bracket (24) whereby said gear shift lever (26) is tiltable about said predetermined second axis (Y).

3. A shift apparatus as set forth in claim 1, **characterized in that** said cam surface (48) has a plurality of recesses (50P, 50R, 50N, 50D, 50F, 50S) positioned on loci (60, 62) which are drawn by one end (34) of said sleeve (30).
4. A shift apparatus as set forth in claim 3, **characterized in that** said recesses (50P-50S) are communicated with guide grooves (52) intervened between the adjacent two of said recesses.
5. A shift apparatus as set forth in claim 4, **characterized in that** said recesses (50P-50S) and said guide grooves (52) have respective depth determined depending upon angles which are made between said sleeve (30) and said cam surface (48) of said position plate (46).

#### Patentansprüche

1. Schalteinrichtung mit einer Welle (14), welche eine vorbestimmte erste Achse (X) aufweist und welche um diese erste vorbestimmte Achse (X) schwenkbar ist, einer Halterung (24), einem Gangschalthebel (26), der an der Halterung (24) zur gemeinsamen Bewegung mit dieser befestigt ist, einer Einrichtung (20) zur Lagerung der Halterung (24) auf der Welle (14), um ein Kippen des Gangschalthebels (26) um eine zweite Achse (Y) zu ermöglichen, die sich quer bezüglich der ersten Achse (X) erstreckt, einem Rastmechanismus, der ein federbelastetes Teil umfaßt, das gegen eine Kurvenfläche (48) einer stationären Platte (46) gedrängt ist derart, daß das federbelastete Teil mit einer Vielzahl von Ausnehmungen (50P, 50R, 50N, 50F, 50D, 50S) in Eingriff bringbar ist, die auf Bogenlinien (60, 62) angeordnet sind, **dadurch gekennzeichnet**, daß der Rastmechanismus eine Hülse (30) umfaßt, welche eine Feder (44) aufnimmt und an ihrem äußeren Ende eine Rastkugel (36) lagert, wobei die Hülse (30) an ihrem inneren Ende (32) schräg an dem Gangschalthebel (26) angebracht ist derart, daß die Rastkugel (36) mit der Vielzahl von Ausnehmungen bei einer gemeinsamen Bewegung der Hülse (30) mit dem Schalthebel (26) in Eingriff bringbar ist.
2. Schalteinrichtung nach Anspruch 1, **dadurch gekennzeichnet**, daß die Lagerungseinrichtung einen Schwenkzapfen (20) umfaßt, der um die vorbestimmte zweite Achse (Y) drehbar ist und die Halterung (24) befestigt, wobei der Gangschalthebel (26) um jene vorbestimmte zweite Achse (Y) kipp-

bar ist.

3. Schalteinrichtung nach Anspruch 1, **dadurch gekennzeichnet**, daß die Kurvenfläche (48) eine Vielzahl von Ausnehmungen (50P, 50R, 50N, 50D, 50F, 50S) aufweist, die an Orten (60, 62) positioniert sind, die von einem Ende (34) der Hülse (30) überstrichen werden.
4. Schalteinrichtung nach Anspruch 3, **dadurch gekennzeichnet**, daß die Ausnehmungen (50P-50S) mit Führungsnuten (52), die zwischen zwei benachbarten Ausnehmungen ausgebildet sind, verbunden sind.
5. Schalteinrichtung nach Anspruch 4, **dadurch gekennzeichnet**, daß die Ausnehmungen (50P-50S) und die Führungsnuten (52) jeweils eine bestimmte Tiefe haben, die in Abhängigkeit von den Winkeln zwischen der Hülse (30) und der Kurvenfläche (48) der Positionierplatte (46), festgelegt ist.

#### Revendications

1. Appareil de changement comportant un arbre (14) ayant un premier axe prédéterminé (X) qui peut tourner autour dudit premier axe prédéterminé (X), un support (24), un levier de changement de vitesse (26) fixé audit support (24) en vue d'un mouvement unitaire avec celui-ci, un moyen (20) pour supporter ledit support (24) sur ledit arbre (14) pour permettre le basculement dudit levier de changement de vitesse (26) autour d'un deuxième axe (Y) s'étendant transversalement relativement audit premier axe (X), un mécanisme de vérification incluant un élément soumis à l'action d'un ressort sollicité contre une surface de came (48) d'un plateau stationnaire (46) de façon que ledit élément soumis à l'action d'un ressort vienne en prise avec une pluralité d'évidements (50P, 50R, 50N, 50F, 50D, 50S) agencés sur des lignes arquées (60, 62), caractérisé en ce que ledit mécanisme de contrôle comporte un manchon (30) qui loge un ressort (44) et supporte une bille de vérification (36) à son extrémité extérieure (34), ledit manchon (30) étant fixé suivant une inclinaison à son extrémité intérieure (32) au levier de changement de vitesse (26) de façon que ladite bille de vérification (36) vienne en prise avec ladite pluralité d'évidements pendant le mouvement unitaire dudit manchon (30) avec ledit levier de changement (26).
2. Appareil de changement selon la revendication 1, caractérisé en ce que ledit moyen de support comporte un pivot (20) pouvant tourner autour dudit deuxième axe prédéterminé (Y) et sur lequel est monté ledit support (24) par quoi ledit levier de

changement de vitesse (26) peut basculer autour dudit deuxième axe prédéterminé (Y).

3. Appareil de changement selon la revendication 1, caractérisé en ce que ladite surface de came (48) comporte une pluralité d'évidements (50P, 50R, 50N, 50D, 50F, 50S) positionnés sur des lieux (60, 62) qui sont tirés par une extrémité (34) dudit manchon (30).  
5  
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4. Appareil de changement selon la revendication 3, caractérisé en ce que lesdits évidements (50P, 50S) communiquent avec des rainures de guidage (52) ménagées entre deux desdits évidements adjacents.  
15
5. Appareil de changement selon la revendication 4, caractérisé en ce que lesdits évidements (50P-50S) et lesdites rainures de guidage (52) ont une profondeur respective déterminée en fonction d'angles qui sont formés entre ledit manchon (30) et ladite surface de came (48) dudit plateau de positionnement (46).  
20  
25  
30  
35  
40  
45  
50  
55

FIG.1

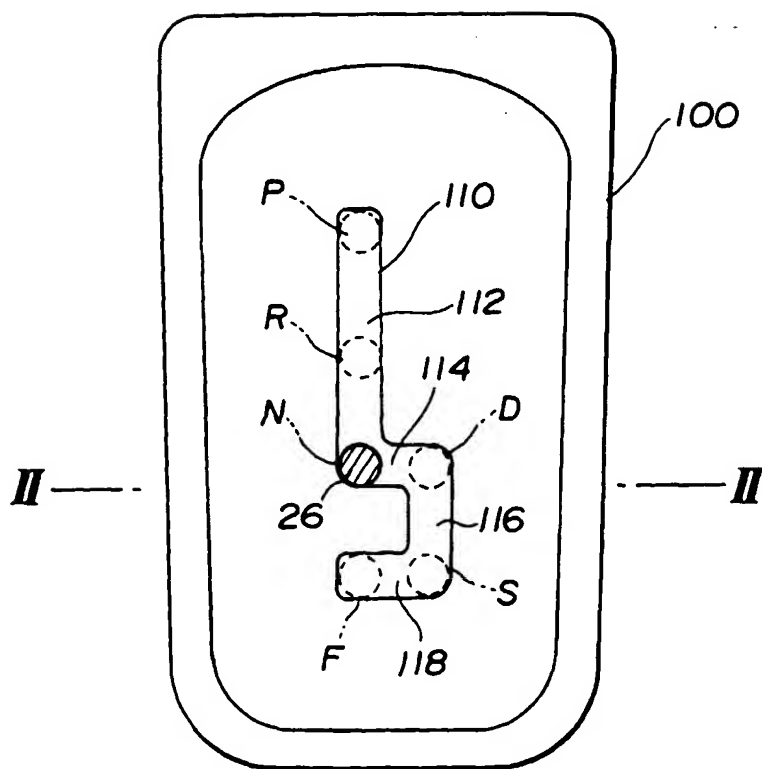


FIG.2

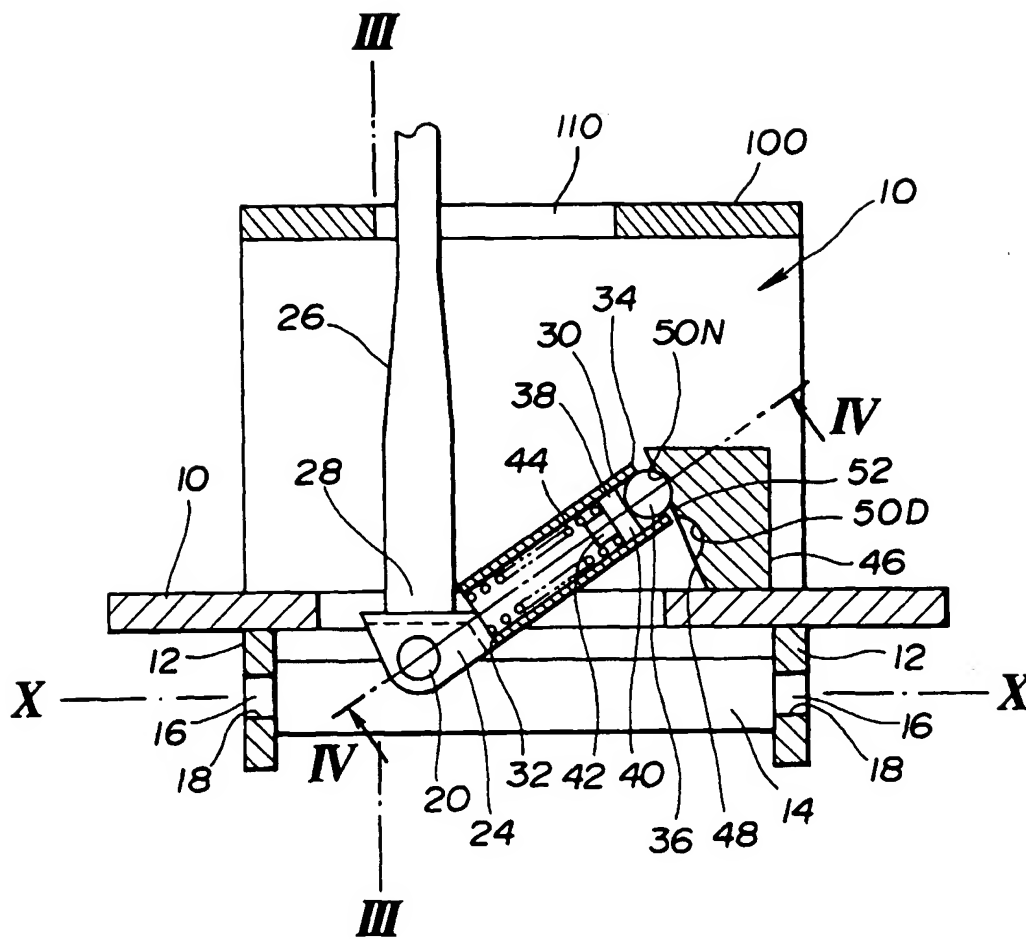


FIG.3

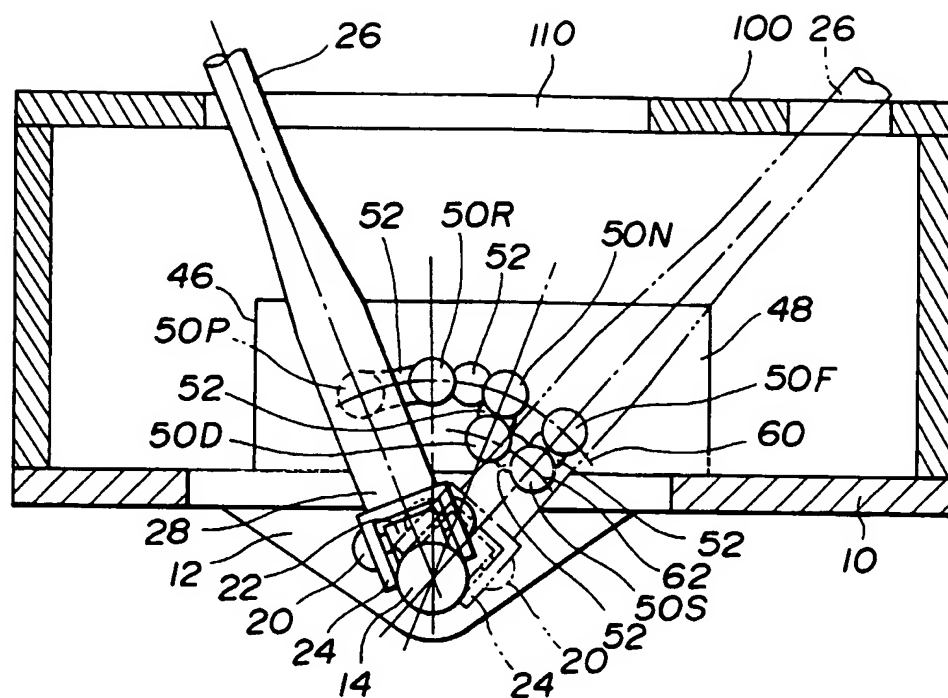


FIG.4

